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वस्त्रादि — उच्च घनत्व  
पोलीइथाइलीन ( एच.डी.पी.ई. ) बुने  
कपड़े से बने तिरपाल — विशिष्टि  
( पाँचवाँ पुनरीक्षण )

Textiles — Tarpaulins Made from  
High Density Polyethylene (HDPE)  
Woven Fabrics — Specification  
( Fifth Revision )

ICS 59.060.20; 59.080.40

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## FOREWORD

This Indian Standard (Fifth Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Textile Materials Made from Polyolefins (Excluding Cordage) Sectional Committee had been approved by the Textile Division Council.

This standard was first published in 1976 and subsequently revised in 1984, 1995, 2005 and 2011. This standard has been revised again to include the following major changes:

- a) Tarpaulins varieties of Type I to Type VII have been included,
- b) Method of measuring the coating and lamination thickness has been incorporated,
- c) Requirements for fixing of eyelets have been modified,
- d) Requirement for mass of the finished tarpaulins has been included,
- e) Requirement for ash content and its test method has been included, and
- f) Requirement for impact failure load and its test method has been included.

Tarpaulins manufactured from laminated high density polyethylene (HDPE) woven fabric are in use for a very long time as there tarpaulins are lighter in weight and have high mechanical strength and long useful life. Tarpaulins has been popularly used as a protective covering in sectors like transport, agriculture, infrastructure, automobiles, wagon covers and also as tents, floor spreads, as a cover for machinery, wagon covers, cap covers etc.

The composition of the Committee responsible for the formulation of this standard is given at Annex G.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Indian Standard*

**TEXTILES — TARPAULINS MADE FROM HIGH  
DENSITY POLYETHYLENE (HDPE) WOVEN FABRICS  
— SPECIFICATION**

*( Fifth Revision )*

**1 SCOPE**

This standard prescribes constructional and performance requirements for tarpaulins made from high density polyethylene woven fabric laminated on both sides for use as a protective covering in sectors like transport, agriculture, infrastructure, automobiles and also as tents, floor spreads, as a cover for machinery, wagon covers, cap covers etc.

**2 REFERENCES**

The standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

**3 MATERIALS****3.1 HDPE Tapes**

Tapes shall be manufactured from HDPE granules (see IS 6192), which shall be UV stabilized by adding suitable UV stabilizer and/or carbon black. The tape, if manufactured by using carbon black shall contain minimum 2.5 percent of carbon black by mass when tested as per IS 2530.

**3.2 HDPE Fabric**

Tarpaulins shall be manufactured from HDPE woven fabric (see IS 6899) so that finished tarpaulin meets the requirements given in 6.2, 6.3 and Table 1.

**3.3 Eyelets**

Unless otherwise agreed to between the buyer and the seller, metallic eyelets conforming to dimensions as per size 28 or 30 of IS 4084 shall be used. Plastic eyelets having similar dimensions may also be used, if agreed to between the buyer and the seller.

**3.4 Line/Cord Beading**

A line/cord beading of minimum 2.5 mm diameter shall be provided along the length and width of the tarpaulin.

**4 TYPES**

Based on the mass, in g/m<sup>2</sup>, of finished tarpaulins, the material is classified as follows:

- a) *Type I* — Having mass of 200 g/m<sup>2</sup>, *Min*;
- b) *Type II* — Having mass of 250 g/m<sup>2</sup>, *Min*;
- c) *Type III* — Having mass of 300 g/m<sup>2</sup>, *Min*;
- d) *Type IV* — Having mass of 340 g/m<sup>2</sup>, *Min*;
- e) *Type V* — Having mass of 400 g/m<sup>2</sup>, *Min*;
- f) *Type VI* — Having mass of 450 g/m<sup>2</sup>, *Min*; and
- g) *Type VII* — Having mass of 500 g/m<sup>2</sup>, *Min*.

**5 MANUFACTURE****5.1 Lamination**

**5.1.1** The fabric shall be laminated on both sides with the low density polyethylene (LDPE) or suitable combination of LDPE and linear low density polyethylene (LLDPE) melt of extrusion coating grade which shall be validated by a certificate from the polymer supplier for each lot. Coating thickness shall not be less than 25  $\mu$ m and the film shall be suitably UV stabilized by incorporating UV stabilizer and/or carbon black. The film, if manufactured by using carbon black, shall contain minimum 2.5 percent of carbon black by mass when tested as per IS 2530 alongwith colour master batch, if required, to get the desired shade such that the finished tarpaulin meets the requirements of UV stability and colour fastness to light as given in Table 1. The coating lamination thickness shall be measured at a pressure of  $2 \pm 0.01$  kPa by Method A of IS 13162 (Part 3).

**5.1.2** In case two or more layers of HDPE fabric are used to manufacture laminated fabric, they shall be bonded by sandwich lamination. The lamination as given above shall be such that the finished tarpaulin meets the requirements given in Table 1. The minimum thickness of the sandwich lamination shall be 40 mm. The sandwich lamination thickness shall be measured at a pressure of  $2 \pm 0.01$  kPa by Method A of IS 13162 (Part 3).

NOTE — Lamination is very important and critical requirement for the product and its proper process control shall be ensured during manufacturing.

**5.2 Construction**

**5.2.1** The tarpaulins shall be constructed by heat sealing

laminated pieces of woven fabric of the desired dimensions. The panels shall be flat (lap) joined. The ends and sides of the tarpaulins shall be hemmed by heat sealing or lock type double stitching. The width of the hem shall be minimum 40 mm. Cross joint may be used at the rate of one in every third panel and no piece less than 900 mm in length shall be used for making the panel. The cross-joint shall be made by lap joint method with a minimum 40 mm overlap. A combination of panel width not less than 1 800 mm may be used to obtain the desired width of tarpaulin. Narrow width panels, not less than 250 mm at rate of one per tarpaulin may be used with other panels to obtain the required width. In all cases, the end panels shall be of full width except where the width of the tarpaulin is less than 2 m, in which case one of the end panels may be less than the full width. The alternate short panels for cross-joint shall be in the opposite ends.

**5.2.2** For tarpaulins used in applications like wagon covers, cap covers etc, where a geometrical shape is required to be given, more than one end panel of required width may be used to obtain the final geometrical shape.

### 5.3 Joints/ Seams

If two or more pieces of fabrics are used for the manufacture of tarpaulin, the fabrics shall be jointed together by a suitable heat sealing process keeping an overlap of at least 3.5 cm.

### 5.4 Fixing of Eyelets

The number and position of metal/plastic eyelets shall be as agreed to between the buyer and the seller. The eyelets shall be provided with the reinforcement pieces for type I tarpaulins only. For tarpaulins of Type II to Type VII, reinforcement pieces shall be provided at four corners only. However, if required by the buyer, eyelets shall be provided with the reinforcement pieces for Type II to Type VII tarpaulins also. The outer edge of the eyelet shall be as close as possible to the line/cord beading.

## 6 REQUIREMENTS

**6.1** The tarpaulins shall meet the requirements as given in Table 1. Besides the tarpaulins shall also meet the requirements given in **6.2** and **6.3**.

### 6.2 Dimensions

The tarpaulins shall be made to the shade and dimensions as specified in the contract or order. The following tolerance shall be permissible for length, width and height (for box type tarpaulins):

<i>Dimension</i>	<i>Tolerance, Percent</i>
Length	+3/-1
Width	+3/-1
Height	+3/-1

## 6.3 Water Proofness

**6.3.1** The fabric and joints of the tarpaulins shall be tested before and after ageing for water repellency by cone test according to IS 7941 and for resistance to water penetration by the pressure head test according to IS 7940 keeping the height of water column as 900 mm and the time of exposure being 1 h. The test specimen shall be so selected that at least one joint is covered. There shall be no leakage when tested by cone test and water does not leak through the tarpaulin when tested for resistance to water penetration by the pressure head test from any test specimen.

**6.3.2** The ageing shall be done at 70°C for 168 h as per the method given in IS 7016 (Part 8).

## 7 MARKING

**7.1** Each tarpaulin shall be legibly marked with the following information at one corner on one side either with tag, label, sticker or by printing on it with the indelible ink:

- Name and address of manufacturer;
- Dimensions and Type;
- Month and year of manufacture; and
- Any other information as required by the law in force.

### 7.2 BIS Certification Marking

The tarpaulins may also be marked with the Standard Mark.

**7.2.1** The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and Rules and Regulations made thereunder. The details of the conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

## 8 PACKING

The tarpaulins shall be packed as agreed to between the buyer and the seller.

## 9 SAMPLING AND CRITERIA OF CONFORMITY

### 9.1 Lot

The quantity of tarpaulin of same size and type manufactured under similar conditions and delivered to a buyer against one dispatch note shall constitute a lot.

**9.2** Unless otherwise agreed to between the buyer and the seller, the number of tarpaulins to be selected at random from a lot shall be as given in col 3 or col 4 of Table 2.

**Table 1 Requirement of Tarpaulins Made from HDPE Woven Fabrics**  
(Clauses 3.2, 5.1.1, 5.1.2 and 6.1)

Sl No.	Characteristics	Requirements							Method of Test, Ref to
		Type I	Type II	Type III	Type IV	Type V	Type VI	Type VII	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	No. of HDPE fabric layers	1	2	2	2	2	3	3	—
ii)	No. of lamination layers	2	3	3	3	3	4	4	—
iii)	Total number of layers in the finished tarpaulin	3	5	5	5	5	7	7	—
iv)	Mass of finished tarpaulin, g/m <sup>2</sup> , <i>Min</i>	200	250	300	340	400	450	500	Annex B
v)	Mass of laminated fabric, g/m <sup>2</sup> , <i>Min</i>	185	230	280	315	370	420	465	Annex C
vi)	Breaking strength before UV exposure, N, <i>Min</i>	1 000	1 100	1 200	1 400	1 600	1 700	1 800	IS 1969 (Part 1)
	a) Warp	750	900	1 100	1 300	1 400	1 500	1 600	
	b) Weft								
vii)	Elongation at break, percent (warp and weft)	15 to 25	15 to 25	15 to 25	15 to 25	15 to 25	15 to 25	15 to 25	IS 1969 (Part 1)
viii)	Retention of breaking strength after UV exposure of 144 h (warp and weft), percent, N	85 percent of original value (fabric) that is Sl No. (vi) of Table 1							IS 13162 (Part 2) and IS 1969 (Part 1)
ix)	Welded seam strength before UV exposure (weft), N, <i>Min</i>	65 percent of original value (fabric) that is Sl No. (vi) of Table 1							IS 1969 (Part 1)
x)	Retention of welded seam strength after UV exposure of 144 h (weft), percent, N, <i>Min</i>	85 percent of original value that is Sl No. (ix) of Table 1							IS 13162 (Part 2) and IS 1969 (Part 1)
xi)	Trapezoid tear strength, N, <i>Min</i>	120	130	150	175	185	195	210	IS 14293
xii)	Puncture resistance, N, <i>Min</i>	300	350	400	450	500	600	700	Annex D
xiii)	Impact failure load, at 1 524 mm drop, <i>Min</i> , gram force at 50 percent failure	600	800	900	1 000	1 150	1 300	1 500	Annex E
xiv)	Colour fastness to light (for coloured tarpaulines)	←————— 4 or better —————→							IS 2454
xv)	Ash content, percent, <i>Max</i>	←————— 3 —————→							Annex F

**Table 2 Sampling**  
(Clauses 9.2 and 9.3)

Sl No.	No. of Tarpaulins in the Lot	Sample Size	Sub-sample Size	Permissible No. of Defective Tarpaulins
(1)	(2)	(3)	(4)	(5)
i)	Up to 50	3	2	0
ii)	51-150	5	2	0
iii)	151-300	8	3	1
iv)	301-500	13	5	2
v)	501 and above	20	5	3

### 9.3 Criteria of Conformity

Characteristic	No. of Tarpaulins/Criteria Conformity	Test Specimens
(1)	(2)	(3)
Dimensions and mass of finished tarpaulins	According to col 3 Table 2	The defective tarpaulins not to exceed the corresponding number given in col 5 of Table 2
Water proofness and mass of the fabric	According to col 4 of Table 2	All the test specimens shall pass the test
All other requirements	According to col 4 of Table 2	All the test specimens shall meet the requirements as given in Table 1

## ANNEX A

(Clause 2)

## LIST OF REFERRED INDIAN STANDARDS

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
1969 (Part 1) : 2009	Textiles — Tensile properties of fabrics — Determination of maximum force and elongation at maximum force: Part 1 Strip method ( <i>third revision</i> )	7016 (Part 8) : 1975	fabrics — Specification ( <i>second revision</i> )
2454 : 1985	Method for determination of colour fastness of textile materials to artificial light (Xenon lamp) ( <i>first revision</i> )	7940 : 1976	Methods of test for coated and treated fabrics: Part 8 Accelerated ageing
2530 : 1963	Methods of test for polyethylene moulding materials and polyethylene compounds	7941 : 1976	Method for determining resistance to penetration by water of fabrics by static pressure head test
4084 : 1978	Specification for eyelets and washers (sail) ( <i>first revision</i> )	13162 (Part 2) : 1991	Method for determining water repellency of fabrics by cone test
6192 : 1994	Textiles — Monoaxially oriented high density polyethylene tapes — Specification ( <i>second revision</i> )	(Part 3) : 1992	Geotextiles — Methods of test
6359 : 1971	Method for conditioning of textiles	14293 : 1995	Determination of resistance to exposure of ultraviolet light and water (Xenon-arc type apparatus)
6899 : 1997	Textiles — High density polyethylene (HDPE) woven		Determination of thickness at specified pressures
			Geotextiles — Methods of test for trapezoid tearing strength

## ANNEX B

[Table 1, Sl No. (iv)]

## TEST METHOD FOR MASS OF FINISHED TARPULIN

**B-1** The finished tarpaulin is laid flat on a smooth surface without any creases. The length and width of the tarpaulin is determined with an accuracy of 0.5 cm.

**B-2** The mass of the finished tarpaulin including eyelets, line/cord beading and overlap is determined to an accuracy of 1 g.

**B-3** Mass in g/m<sup>2</sup> of the finished tarpaulin is calculated by the following formula:

$$\text{Mass of finished tarpaulin, g/m}^2 = \frac{M}{A \times B}$$

where

$M$  = mass of finished tarpaulin, in g;

$A$  = length of finished tarpaulin, in m; and

$B$  = width of finished tarpaulin, in m.

## ANNEX C

[Table 1, Sl No. (v)]

## TEST METHOD FOR MASS OF TARPAULIN LAMINATED FABRIC

**C-1** The finished tarpaulin is laid flat on a smooth surface without any creases. Take three test pieces of 1 m × 1 m from the finished tarpaulin without any overlap or joint. While taking the samples, it shall be ensured that no warp and weft tapes are repeated in the test samples.

**C-2** Prior to test, the test samples shall be conditioned to moisture equilibrium from dry side in the standard atmosphere of 65 ± 2 percent relative humidity and 27 ± 2°C temperature (*see* 6359).

**C-3** The length and width of the test specimen is determined with an accuracy of 1 mm.

**C-4** The mass of the test specimen is determined to an accuracy of 1 g.

**C-5** Mass in g/m<sup>2</sup> of the tarpaulin fabric is calculated by the following formula:

$$\text{Mass of tarpaulin fabric, g/m}^2 = \frac{M}{A \times B}$$

where

*M* = mass of test specimen, in g;

*A* = length of test specimen, in m; and

*B* = width of specimen, in m.

**C-6** Similarly, determine the mass in g/m<sup>2</sup> of the tarpaulin fabric for other two test specimens and determine the average of all the three values.

## ANNEX D

[Table 1, Sl No. (xii)]

## TEST METHOD FOR INDEX PUNCTURE RESISTANCE

**D-1 GENERAL**

This test method is used to measure the index puncture resistance of tarpaulins.

**D-2 PRINCIPLE**

A test specimen is clamped without tension between circular plates of a ring clamp attachment secured in a tensile testing machine. A force is exerted against the centre of the unsupported portion of the test specimen by a solid steel rod attached to the load indicator until rupture of the specimen occurs. The maximum force recorded is the value of puncture resistance of the specimen.

**D-3 APPARATUS**

**D-3.1 Tensile/Compression Testing Machine**, of the constant-rate-of extension (CRE) type.

**D-3.2 Ring Clamp Attachment**, consisting of concentric plates with an open internal diameter of 45 ± 0.025 mm capable of clamping the test specimen without slippage. A suggested clamping arrangement

is shown in Fig. 1. The external diameter is suggested to be 100 ± 0.025 mm. The diameter of the six holes used for securing the ring clamp assembly is suggested to be 8 mm and equally spaced at a radius of 37 mm. The surfaces of these plates can consist of grooves with 'o'-rings or coarse sandpaper bonded onto opposing surfaces.

**D-3.3 Solid Steel Rod**, with a diameter of 8 ± 0.01 mm having a flat end with a 45° × 0.8 mm chamfered edge contacting the test specimen's surface (*see* Fig. 2).

**D-4 SAMPLING****D-4.1 Laboratory Sample**

For the laboratory sample take a swatch extending the full width of the product, of sufficient length along the selvage from each sample roll so that the requirements of **D-4.2** can be met.

**D-4.2 Test Specimens**

Select from the laboratory sample, five number of samples each having a minimum diameter of 100 mm

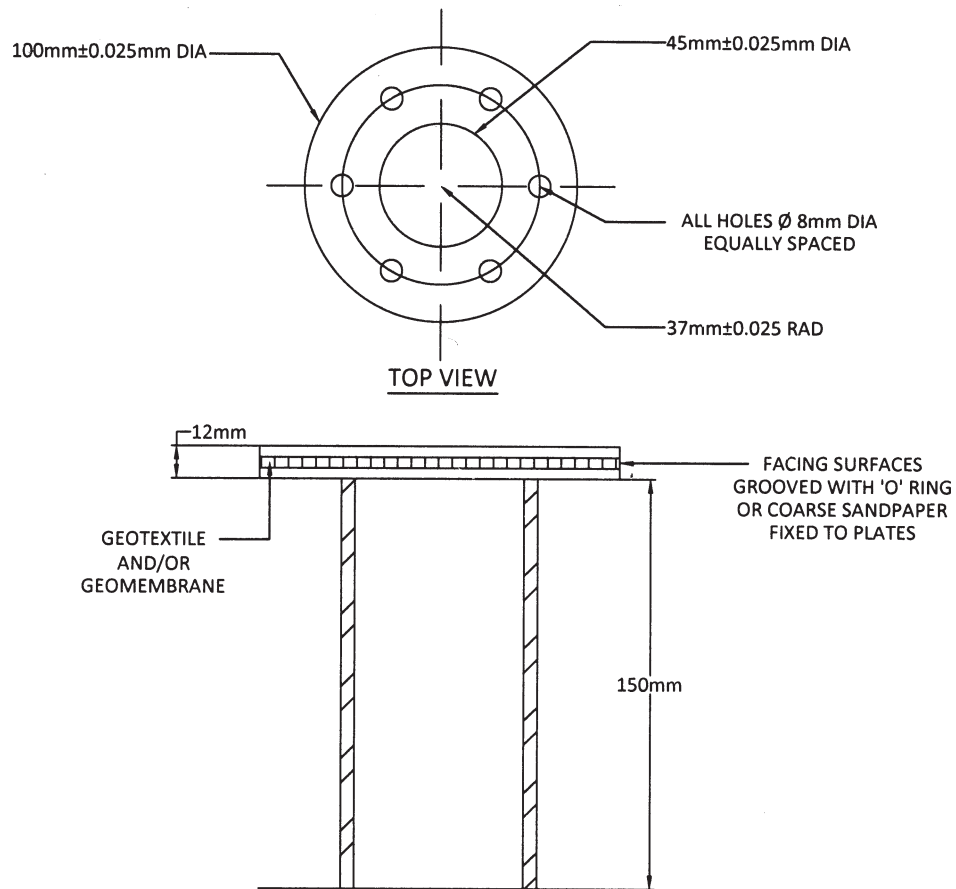


FIG. 1 TEST FIXTURE DETAIL (NOT TO SCALE)

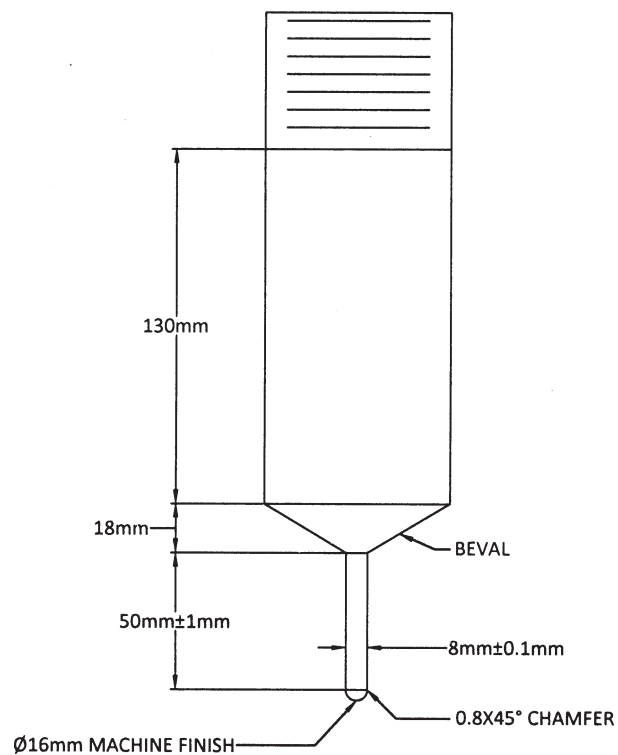


FIG. 2 TEST PROBE DETAIL (NOT TO SCALE)



to facilitate clamping. Space the specimens along a diagonal on the unit of the laboratory sample. Take no specimens nearer the selvage or edge of the tarpaulin.

## D-5 CONDITIONING

Bring the specimens to moisture equilibrium in the atmosphere for testing tarpaulins ( $65 \pm 5$  percent relative humidity and at  $27 \pm 2^\circ\text{C}$ ). Equilibrium is considered to have been reached when the increase in the mass of the specimen, in successive weighings made at intervals of not less than 2 h, does not exceed 0.1 percent of the mass of the specimen.

## D-6 PROCEDURE

**D-6.1** Select the load range of the tensile/compression testing machine such that the rupture occurs between 10 and 90 percent of the full-scale load.

**D-6.2** Centre and secure the specimen between the holding plates ensuring that the test specimen extends to or beyond the outer edges of the clamping plates.

**D-6.3** Test at a machine speed of  $300 \pm 10$  mm/min until the puncture rod completely ruptures the test specimen.

NOTE — The rate of testing specified is not an indication of the performance of the specimen for its end use.

**D-6.4** Read the puncture resistance from the greatest force registered on the recording instrument during the test.

## D-7 CALCULATION

Calculate the average puncture resistance and standard deviation for all tests as read directly from the recording instrument.

# ANNEX E

[Table 1, *Sl No.* (xiii)]

## DETERMINATION OF IMPACT RESISTANCE

### E-1 TERMINOLOGY

**E-1.1 Impact Failure Load** — The load at which 50 percent of the specimens fail when tested by this method.

### E-2 ANNULAR SPECIMEN CLAMP

**E-2.1 A Two Piece Annular Specimen Clamp**, having an inside diameter of 12.7 cm and conforming to the following requirements:

- The lower or stationary half of the clamp shall be rigidly mounted so that the plan of the specimen is horizontal and at an angle of  $90^\circ$  with respect to the upright shaft-supporting member of the apparatus.
- The upper or movable portion of the clamp shall be designed to maintain positive and planar contact with the lower portion of the clamp when in position. This portion of the clamp shall be provided with suitable means for maintaining sufficient contact with the lower clamp to hold the specimens firmly in place during the test.
- Gasketing materials prepared from rubber or similar material shall be affixed to the specimen

contact surfaces of both clamps. This provides a cushion which minimizes thickness variation effects and also allows firm gripping of the specimen and minimizes slippage.

**E-2.2 Adapter** — An electromechanical (pneumatic) or similar suitable device for use in supporting and instantaneously releasing the dart so that it will fall freely on to the centre of test specimen in the specimen holder.

**E-2.3 Dart** — It consists of 3.81 cm diameter hemispherical head fitted with 0.64 cm diameter shaft 11.5 cm long, to accommodate removable mass. The head shall be constructed of aluminium, phenolic plastic or other low density material of similar hardness. The shaft shall be attached to the centre of the flat upper surface of the head with its longitudinal axis at  $90^\circ$  to the surface. The shaft shall be made of aluminium with a 1.27 cm long steel tip (tip with suitable material) at the end for supporting it in the adapter.

**E-2.4 Masses** — The stainless steel detachable masses as follows:

One mass of  $3\,000 \pm 5$  g, two masses of  $1\,000 \pm 5$  g each, two masses of  $500 \pm 2$  g each, two masses of  $300 \pm 2$  g each, two masses of  $200 \pm 2$  g each and two

masses of  $100 \pm 2$  g each having approximate dimensions of 8 to 10 cm in diameter and approximately 1 cm thickness with a hole in the centre of minimum 0.65 cm in diameter.

NOTE — Additional masses may be constructed for use, if it is necessary to extend mass beyond that attainable when using all the masses in the set suggested above.

**E-2.5 Positioning Device** — Means shall be provided for positioning the dart at the following drop heights from the impinging surface of the dart head to the surface of the test specimen:

<i>Positioning</i>	<i>Drop Height mm</i>
Normal impact resistant fabric	660
High impact resistant fabric	1 524

**E-2.6 Cushioning and Shielding Devices** — To protect personnel and to avoid damaging of the impinging surface of the dart.

### E-3 TEST SPECIMENS

Test specimens shall be large enough to extend outside the specimen clamp gaskets at all points. The specimens shall be representative of the material under test and shall be free from pinholes, wrinkles, folds or other obvious imperfections, unless such imperfections constitute variables under test.

### E-4 PROCEDURE

**E-4.1** Place the specimen over the bottom portion of

the clamp, making certain that it is uniformly flat, free of folds and that it covers the gasket at all points. Clamp the specimen in place of applying annular pressure with the top portion of the clamp. Position the dart vertically with the steel shaft tip inserted in the adapter and the impinging surface of the dart at the appropriate height from the fabric surface. Release the dart. Take care to avoid multiple impacts in cases where the dart bounces off the specimen. Attempt to catch the dart in such cases to prevent damage to the impinging surface.

**E-4.2** Observe the failure as any break through the fabric readily by viewing the specimen under back lighting conditions and examine the specimen to determine whether it has failed or not. Use a new specimen for each impact.

**E-4.3** Before beginning the test, make a few trial runs to establish approximately the working range of masses which will break the fabric. Then for at least 3 dart masses selected to give percentage failure between 20 and 80, a minimum of 10 test specimens at each dart mass shall be tested.

### E-5 DETERMINATION OF IMPACT FAILURE LOAD

Plot the percentage of failures against total mass of the dart on a graph paper and determine the results graphically. Read the value of impact failure load from the graph as the dart mass at which 50 percent of the specimens fail.

## ANNEX F

[Table 1, Sl No. (xv)]

### DETERMINATION OF ASH CONTENT

#### F-1 PRINCIPLE

The procedure is used to find out the inorganic residue in tarpaulin sample by ashing it in a muffle furnace. A weighed amount of tape/fabric sample is heated to 590°C. The polymer sample (organic portion) is burnt at 590°C until constant mass of inorganic matter is obtained. The residue (inorganic matter) is reported in terms of percentage ash content in a given sample.

#### F-2 APPARATUS

**F-2.1 Weighing Balance**, accurate to 0.001 g.

**F-2.2 Silica Crucibles**, sufficient volume to accommodate about 3 g of sample in such a way that level of the sample after filling the crucible does not cross half the height of crucible.

**F-2.3 Bunsen Burner**

**F-2.4 Silica Triangle and Tripod**

**F-2.5 Muffle Furnace**, capable of being controlled thermostatically at  $590 \pm 10^\circ\text{C}$ .

**F-2.6 Desicator**, containing an effective drying agent

(for example silica gel) that does not react chemically with ash components.

### **F-2.7 Gloves and Crucible Holder**

## **F-3 SAFETY**

**F-3.1** Burn the sample in an effectively ventilated hood.

**F-3.2** Keep the hood closed and do not inhale the fumes of combustion.

**F-3.3** Wear gloves and use sample (crucible) holder, to introduce crucible in the furnace.

**F-3.4** Sample shall be folded properly to accommodate it in silica crucible.

## **F-4 PROCEDURE**

**F-4.1** Heat the clean crucible at  $590 \pm 10^{\circ}\text{C}$  for 10 to 15 min and cool it in a desiccator.

**F-4.2** Weigh the empty crucible to nearest 0.001 g.

**F-4.3** Weigh about 3 g of tarpaulin sample in the crucible (nearest to 0.001 g).

**F-4.4** Heat the crucible directly on bunsen burner so that the sample burns slowly and loss of ash is avoided. Continue burning until no more smoke is evolved.

**F-4.5** Transfer the crucible in the muffle furnace, which is already maintained at approximately  $590^{\circ}\text{C}$  and keep the crucible inside for about 2 h.

**F-4.6** Remove the crucible from the furnace and cool it to the room temperature in a desiccator. Weigh it and record the weight to accuracy of 0.001 g.

**F-4.7** Keep the crucible in the muffle furnace for another half an hour, cool in a desiccator and weigh again. Repeat the procedure until constant mass is obtained.

## **F-5 CALCULATIONS**

$$\text{Percent ash content} = \frac{\text{Weight of ash}}{\text{Weight of tarpaulin sample}} \times 100$$

## ANNEX G

*(Foreword)*

## COMMITTEE COMPOSITION

## Textile Materials Made from Polyolefins (Excluding Cordage) Sectional Committee, TXD 23

<i>Organization</i>	<i>Representative(s)</i>
Indian Institute of Packaging, Mumbai	PROF (DR) N. C. SAHA ( <b>Chairman</b> )
ACC Limited, Mumbai	SHRI AKSHAT AGRAWAL SHRI AMEYA S. KAGALKAR ( <i>Alternate</i> )
All India Flat Tape Manufacturers' Association, New Delhi	SHRI K. S. ARORA SHRI GURDEEP SINGH ( <i>Alternate</i> )
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**FABRICS — SPECIFICATION**

*(Fifth Revision)*

*(Page 1, clause 5.1.1, line 6) — Substitute ‘25 micron’ for ‘25 im’.*

*(Page 1, clause 5.1.2, line 6) — Substitute ‘40 micron’ for ‘40mm’.*

*(Page 2, clause 5.3, line 4) — Substitute ‘35 mm’ for ‘3.5 cm’.*